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Observations of the Variable Star S Ursae Majoris. R.A. xii. 39. 7; Dec. 61° 41′ 8 N. By Cuthbert E. Peek, M.A.

The above is one of the long-period variable stars under regular observation, and the series just presented covers a period of six years, extending from 1886 July to 1892 June.

The sketch diagram appended shows most of the stars near the variable; several are conspicuous, and the field can be identified without difficulty. Six of the stars are to be found in Argelander's chart, and using these as a basis the magnitudes of the remainder were determined by taking the mean of several series of careful eye estimations. This was done in 1886, and on the receipt of Prof. Pickering's work, *Variable Stars of Long Period,* in 1891, several of the Rousdon magnitudes of these comparison stars were found to be identical with those determined at Harvard Observatory, the mean difference being ·5 magnitude in excess. The necessary correction has been applied throughout; these observations, therefore, are strictly comparable with those of Harvard College. It will be seen from the annexed table that the Harvard College magnitudes are only estimated to the nearest whole magnitude.

The light varies to the extent of about five magnitudes, the brightest maximum being 7·3 magnitude, and the faintest minimum 12·5 magnitude. It is always more or less red, and generally well defined, in contradistinction to some other variables which on several occasions have been noted as somewhat similar to a planetary nebula when other stars in the field could be brought to an absolutely sharp focus.

The observations were made with a $6\frac{4}{10}$ inch achromatic equatoreal telescope, the eyepieces commonly in use giving powers of 36, 80, and 136.

Argelander's method of observation has been followed throughout, the usual practice being to compare the variable with five other stars, the mean resulting magnitude being entered for the date given. Observations have been made on 146 nights, and 10 maxima and minima have been recorded. The dates of the maxima and minima given are the actual dates when the greatest and least brightness was observed. On the diagram the dots representing observations are simply joined by straight lines.

Several interesting irregularities are shown. The abrupt pause in the increase, and tendency to form small maxima, are well shown in 1887 February and March, and again in September and October. The pause in 1888 March and April was unusually long. About the maxima in 1890 November and 1891 July the light curve was much flatter than usual and the irregularities greatly diminished. At the maximum in 1892 March the contrary was observed, and the curve was more sudden than at any other maximum of this series. The light at various maxima has been observed to range from 7·5 to 8·2 magnitude.

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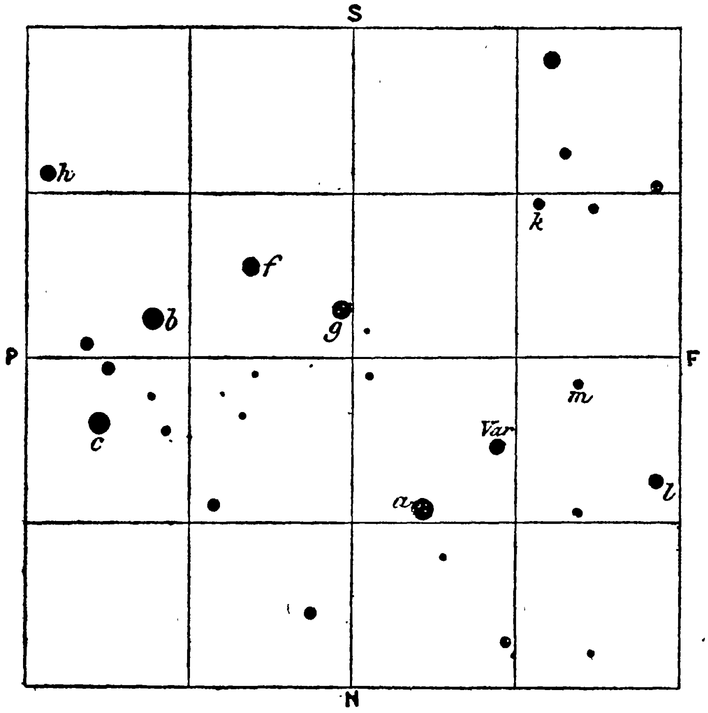
Towards the minima several smaller irregularities are observed. A short pause is seen in the downward curve in 1886 November and 1888 February. At the minimum between these dates the light curve was abnormally flattened, and between June 16 and August 4 the star only declined ·5 magnitude. Before the minimum on 1888 September 30, the star showed a temporary minimum and sudden increase. It is open to question whether the magnitude given as the minimum on 1891 April 15 represents actually the least brightness, as the light curve seems to show that, had more frequent observations been possible, a lower magnitude would have been registered. The light at minimum has been observed to range from 11·5 to 12·5 magnitude.



(One square degree.)

Harvard Magnitudes:

a	6 mag.	*c*	7 mag.	*g*	9 mag.	*k*	10 mag.
b	7 ,,	*f*	9 ,,	*h*	10 ,,	*l*	10 ,,
		m	11 mag.				

The table of maxima shows great irregularities, the intervals ranging from 212 to 240 days. The mean period, however, of the 10 maxima is 225·6 days, a result differing only ·8 day from the period given in *A Revised Catalogue of Variable Stars*, by J. E. Gore. The table of minima shows still greater irregularities. There is a difference of forty-seven days between the longest and shortest intervals, and at the minimum of 1889 May 10 the difference between the predicted and observed dates amounted to no less than sixty-two days.

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With regard to the actual observations, it may be mentioned that at the telescope the diagram, containing the stars indicated by letters, is alone used, the register of magnitudes being kept in the computing room. By this means an impartial observation is obtained, it being clearly impossible to remember the magnitudes of the (approximately) 300 comparison stars used in the observation of the variables on the working list.

The observations have been, in great part, made by my assistant, Mr. C. Grover, checked on all available opportunities by myself.

Observations of S Ursæ Majoris.

Maxima.

Date.	Mag.	Interval.	Predicted Date.	Authority.	Difference between Predicted & Observed.
		days			days
1886 Aug. 9	8·0	...	July 24	N. and C.O.	−16
1887 Mar. 27	7·8	230	Mar. 10	C.O.	−17
Nov. 1	7·6	219	Oct. 29	C.O.	− 3
1888 June 9	8·2	221	June 9	N. and C.O.	
1889 Feb. 4	7·6	240	Mar. 7	Sch.	+31
Sept. 22	7·9	230	Oct. 26	C.O.	+34
1890 April 22	7·7	212	April 27	C.O.	+ 5
Nov. 27	8·0	219	Dec. 9	C.O.	+12
1891 July 18	7·9	233	July 24	C.O.	+ 6
1892 Mar. 1	7·3	227	Mar. 6	C.O.	+ 5

N. = *Nature.*

C.O. = *Companion to the Observatory.*

Sch. = Schönfeld.

Observations of S Ursæ Majoris.

Minima.

Date.	Mag.	Interval.	Predicted Date.	Authority.	Difference between Predicted & Observed.
		days			days
1886 Dec. 15	12·5	...	Nov. 14	C.O.	−31
1887 Aug. 4	11·5	232	July 1	N. and C.O.	−34
1888 Feb. 16	12·2	196	Feb. 15	N. and C.O.	− 1
Sept. 30	12·3	227	Oct. 1	N. and C.O.	+ 1
1889 May 10	12·5	223	July 11	C.O.	+62
1890 Jan. 8	11·7	243			
Aug. 23	11·7	228	Aug. 24	C.O.	+ 1
1891 April 15	11·7	235	April 7	C.O.	− 8
Nov. 3	12·0	202	Nov. 19	C.O.	+16
1892 June 11	12·5	221	July 2	C.O.	+21

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Comparison Stars for S Ursæ Majoris.

	Harvard.	Rousdon.
a	6·0	6·0
b	7·0	7·0
c	7·0	7·3
f	9·0	8·6
g	9·0	9·0
h	10·0	10·1
k	10·0	9·8
l	10·0	10·1
m	11·0	10·9

Rousdon Observatory, Lyme Regis:
1892 *September* 19.

The Geminid Meteor Shower, 1892 *December* 12.

By W. F. Denning.

The night of December 12 appears to have been clear over the country generally, and observations were obtained at many places. It is probable, however, that the Geminid display had then passed its maximum.

Professor A. S. Herschel, at Slough, watched the western sky during three hours of the interval between 10^h 45^m and 14^h 38^m, and registered the paths of twenty-four shooting stars. Five others had been recorded earlier in the same night. The radiant of the Geminids was not very active nor its position sharply defined, most of the tracks of the conformable meteors having been observed at a considerable distance from it. Some conspicuous meteors were recorded which belonged to the numerous minor showers of the epoch, including Ursids, Leonids, Perseids, &c.

Mr. H. Corder, at Bridgwater, counted sixty-six shooting stars during watches covering about 5¼ hours (6^h to 8^h, and 10^h to 13^h 15^m). He found the chief Geminid radiant at 109° + 34° (38 meteors), and there was a secondary display at 117° + 30° (12 meteors).

At Bristol I looked towards the eastern sky during a period equivalent to 1½ hour between 9^h 45^m and 11^h 30^m, and observed twenty shooting stars, of which about fifteen were Geminids. The chief radiant point was at 119° + 29°, 4½° E. of *β Geminorum*, and the centre of the true Geminids appeared to be indistinctly marked at 107° + 34° from six tracks. The two showers are, I believe, quite separate; that from near *β Geminorum* usually gives brighter and longer meteors than the companion radiant N.W. of *α*. I had already seen this pair of contemporary